INTERNATIONAL SALT COMPANY

James A. Loose
Plant Manager

WATKINS GLEN REFINERY
Watkins Glen, New York 14891
Phone: 607/535-2721

July 3, 1985

Mr. Leon Lazarus
U.S. EPA
Drinking & Groundwater Protection Branch
26 Federal Plaza
New York, N. Y. 10278

Dear Mr. Lazarus:

Attached is the Cementing Records Report prepared by Mr. Larry Sevenker and dated 5/15/85.

If you have questions, feel free to contact myself or Mr. Sevenker directly.

We plan to start pressure testing of wells on 7/15/85.

Very truly yours,

J. A. Loose

Plant Manager
INTERNATIONAL SALT COMPANY

JAL/r
Attachment
cc: Mr. Walter E. Andrews, Chief
Drinking & Groundwater Protection Branch

Cementing Records Report
Mechanical Integrity Testing

May 15, 1985

For

International Salt Company
Salt Plant Road
Watkins Glen, NY 14891

Mr. Jim Loose
(607) 535-2721

Prepared by

Larry Sevenker
Consulting Engineer
4148 Loire Drive
Kenner, LA 70065

(504) 468-1909

International Salt Company

Cementing Records Report
Mechanical Integrity Testing

As part of the EPA's mechanical testing requirement for the UIC program, this report summarizes the cementing records of the injection wells at International Salt Company's brine field at Watkins Glen. The cementing records are offered to indicate that there is no significant leak into a ground water source through a vertical channel adjacent to the well bore.

Relative well data and the cementing calculations are tabulated. The calculations present the computed volume in the open hole and cased hole portion of the each well. The total cement volume placed is compared to the total annulus volume and the excess cement determined.

The headings for each column of the tabulations are discussed in the following:

Well No - The well number of each injection well in International's brine field is listed as these are the wells being included in the permit application.

Csg Size ID - Casing size is the inside diameter of the surface casing.

Csg Depth - Casing depth is the setting depth of the surface casing. The surface casing is the cased hole portion of the well inwhich the the tubing is cemented.

Hole Size - Hole size is the drilling bit size used to drill the hole after the surface casing is set. Cementing of the tubing in the bore hole is the open hole portion of the well.

Hole Depth - Hole depth is the depth from the surface that the tubing is set for cementing.

Tubing Size OD - Tubing size is the inner tubing or casing that is cemented in the surface casing and open bore hole. The outer diameter is used as the annulus between the tubing and the surface casing or bore hole is the cemented zone.

Cement Pumped - Cement is pumped down the inside of the tubing and returns up the annulus outside the tubing. Once the cement volume is pumped, the remaining cement in the tubing is displaced with a pump-down plug to a float shoe on the bottom of the tubing. This remaining cement and plug are displaced with drilling mud to the bottom of the tubing. The cementing is conducted by a service company such as Halliburton Services that is an established cementing company. The cement pumped is measured in sacks and delivered in a dry bulk form to the well site. Cement is mixed with water or brine to produce a cement slurry for pumping.

Open Hole - The open hole portion of the well is the calculation of the height difference between the tubing setting depth and the surface casing depth.

Cased Hole - The cased hole portion of the well is the same as the setting depth of the surface casing.

Annulus Vol Open - The annulus volume in the open hole is the calculation of the volume between the bore hole and the tubing over the height of the open hole portion of the well. Cementing takes place in this annulus outside the tubing and against the drilled formation.

Annulus Vol Cased - The annulus volume in the cased hole is the calculation of the cement volume requirement in the annulus between the tubing and the surface casing over the height of the surface casing.

Annulus Vol Total - The annulus volume is the calculated sum of the open hole and cased annulus volumes noted above. This volume is calculated in cubic feet of cement necessary to cement the well from the bottom of the tubing to the surface. This is common practice in International's solution mining wells.

Cement Yield - The cement pumped was measured in sacks and as water or brine are added, the dry bulk volume must be converted to a cement yield volume in cubic feet to represent a cement volume that is equated to the required cementing volume. The yield factors are different for various types of cement. The following yield factors were used to correspond to the type of cement used in the wells:

Cement Type	Yield
Common or Class A	1.18 cf/sk
Pozmix A Cement	1.22 cf/sk
Halliburton Light	1.54 cf/sk

Excess Cement Vol - Excess cement volume is the calculated difference between the cement yield and the annulus volume total. In all wells evaluated, there was excess cement in the pumped cement volume to fill the total calculated annulus volume.

Excess Cement % - The percent excess cement was calculated by the ratio of the excess cement volume to the open hole annulus volume. The cased hole volume is between the casing and the tubing and requires no excess. In most cases this volume is relatively small compared to the open hole volume and has little impact. The open hole portion of the well requires the excess cement due to the hole enlargement and formation loss factors.

In calculating the cement yield from the cement pumped volume, the type of cement determines the conversion factor as listed above. All the injection wells being evaluated were cemented with common or Class A cement, except for the wells noted below. Common cement when mixed with water or brine has a yield of 1.18 cf/sk. Wells 4B, 53, 54, 55, 56, and 57 were cemented with Pozmix A cement which has a yield of 1.22 cf/sk. The cementing records for wells 45, 49, 50, 51, 52,and 53A indicate the type of cement used was Halliburton

Light which has a yield of 1.54 cf/sk. These conversion factors were used in the calculation of the individual well cement yield volume.

The cementing records appear to indicate that all the injection wells were cemented using the pumping method. These wells were cemented from the bottom of the tubing or cemented casing upward in the annulus. The volume of cement pumped exceeded the total calculated annulus volume of the open hole and cased hole portions of the well from the tubing setting depth to the surface. These cementing records would indicate that sufficient well cement was placed in the annulus to prevent a significant leak into any ground water source through vertical channels adjacent to the well bore.

International Salt Company

Well Data and Cementing Records

Well No	Csg Size ID (in)	Csg Depth (ft)	Hole Size (in)	Hole Depth (ft)	Tubing Size OD (in)	Cement Pumped (sks)	Open Hole (ft)	Cased Hole (ft)
1A	7.88	0	7.88	1542	5.50	700	1542	0
4B	8.10	94	7.88	1758	5.50	340	1664	94
7	10.05	70	9.88	1145	7.00	1000	1075	70
27	12.62	21	12.25	2538	8.63	1380	2517	21
28	12.62	49	12.25	2703	8.63	1500	2654	49
30	15.13	74	15.00	2844	10.75	1600	2770	74
31	7.83	120	7.50	2801	5.50	440	2681	120
34	7.83	175	7.50	2787	5.50	545	2612	175
35	12.42	38	12.25	2800	8.63	1300	2762	38
36	12.42	38	12.25	2817	8.63	1400	2779	38
37	12.42	36	12.25	2671	8.63	1370	2635	36
38	12.42	76	12.25	2650	8.63	1418	2574	76
39	15.12	85	12.25	2875	8.63	1500	2790	85
40	15.12	40	12.25	2859	8.63	1420	2819	40
41	12.42	76	12.25	2820	8.63	1500	2744	76
42	12.42	78	12.25	2689	9.63	1100	2611	78
43	12.42	25	9.00	2829	5.50	960	2804	25
44	12.42	68	12.25	2828	8.63	1500	2760	68
45	12.72	218	12.25	2870	8.63	1373	2652	218
46	15.25	152	12.25	1908	8.63	1050	1756	152
47	12.72	104	12.25	2905	8.63	2094	2801	104
48	12.42	72	12.25	2912	8.63	2000	2840	72
49	12.72	72	12.25	2926	8.63	950	2854	72
50	12.42	42	12.25	2835	8.63	850	2793	42
51	12.42	70	12.25	2790	8.63	1050	2720	70
52	12.42	44	12.25	2750	8.63	950	2706	44
53	12.42	39	12.25	936	5.50	620	897	39
53A	12.42	29	12.25	1319	9.63	1000	1290	29
54	12.42	40	12.25	1435	9.63	500	1395	40
55	13.42	40	12.25	2882	8.63	1300	2842	40
56	12.42	66	12.25	2930	8.63	1300	2864	66
57	12.42	80	12.25	2764	8.63	1100	2684	80

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Cementing Calculations

Well No	Cement Pumped (sks)	Open Hole (ft)	Cased Hole (ft)	Annulus Vol Open (cf)	Annulus Vol Cased (cf)	Annulus Vol Total (cf)	Cement Yield Vol (cf)	Excess Cement Vol (cf)	Excess Cement % Open H
1A	700	1542	0	267	0	267	826	559	209%
4B	340	1664	94	288	18	306	415	109	38%
7	1000	1075	70	284	20	304	1180	876	308%
27	1380	2517	21	1038	10	1048	1628	580	56%
28	1500	2654	49	1095	23	1117	1770	653	60%
30	1600	2770	74	1653	46	1698	1888	190	11%
31	440	2681	120	380	20	400	519	119	31%
34	545	2612	175	370	30	400	643	243	66%
35	1300	2762	38	1139	17	1156	1534	378	33%
36	1400	2779	38	1146	17	1163	1652	489	43%
37	1370	2635	36	1087	16	1103	1617	514	47%
38	1418	2574	76	1062	33	1095	1673	578	54%
39	1500	2790	85	1151	72	1222	1770	548	48%
40	1420	2819	40	1163	34	1197	1676	479	41%
41	1500	2744	76	1132	33	1165	1770	605	53%
42	1100	2611	78	817	26	843	1298	455	56%
43	960	2804	25	776	17	793	1133	340	44%
44	1500	2760	68	1139	30	1168	1770	602	53%
45	1373	2652	218	1094	104	1198	2114	917	84%
46	1050	1756	152	724	131	855	1239	384	53%
47	2094	2801	104	1155	49	1205	2471	1266	110%
48	2000	2840	72	1172	31	1203	2360	1157	99%
49	950	2854	72	1177	34	1212	1463	251	21%
50	850	2793	42	1152	18	1170	1309	139	12%
51	1050	2720	70	1122	30	1152	1617	465	41%
52	950	2706	44	1116	19	1135	1463	328	29%
53	620	897	39	586	26	612	756	144	25%
53A	1000	1290	29	404	10	414	1540	1126	279%
54	500	1395	40	437	13	450	610	160	37%
55	1300	2842	40	1172	23	1195	1586	391	33%
56	1300	2864	66	1181	29	1210	1586	376	32%
57	1100	2684	80	1107	35	1142	1342	200	18%